{In Archive} Fw: Responses to EPA Risk Assessment Comments on West Lake Landfill SFS

Dan Gravatt to: Gregory McCabe 05/12/2011 02:02 PM

Archive: This message is being viewed in an archive.

Greg,

Here's the second batch of RTCs on the risk assessment comments.

Daniel R. Gravatt, PG
US EPA Region 7 SUPR / MOKS
901 North 5th Street, Kansas City, KS 66101
Phone (913) 551-7324 Fax (913) 551-7063

----- Forwarded by Dan Gravatt/R7/USEPA/US on 05/12/2011 02:02 PM -----

From:	"Paul Rosasco" <paulrosasco@emsidenver.com>
To:	Dan Gravatt/R7/USEPA/US@EPA
Cc:	Rich Kapuscinski/DC/USEPA/US@EPA, <shawn.muenks@dnr.mo.gov>
Date:	04/27/2011 11:52 AM
Subject:	RE: Responses to EPA Risk Assessment Comments

Please ignore my first e-mail. I sent out a draft version of the responses by mistake. Attached are the final responses to the long-term risk comments.

From: Gravatt.Dan@epamail.epa.gov [mailto:Gravatt.Dan@epamail.epa.gov]
Sent: Wednesday, April 27, 2011 8:49 AM
To: paulrosasco@emsidenver.com
Cc: Kapuscinski.Rich@epamail.epa.gov; shawn.muenks@dnr.mo.gov
Subject: Re: Responses to EPA Risk Assessment Comments

Paul, the ZIP files you attached to this email were stripped out by my servers - see below. Please change the filename as recommended and resend. I don't know if Shawn or Rich had similar problems.

Thanks,
Daniel R. Gravatt, PG
US EPA Region 7 SUPR / MOKS
901 North 5th Street, Kansas City, KS 66101
Phone (913) 551-7324 Fax (913) 551-7063

0714

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OU01

-----"Paul Rosasco" <paulrosasco@emsidenver.com> wrote: -----
To: Dan Gravatt/R7/USEPA/US@EPA, "'Muenks, Shawn'" <shawn.muenks@dnr.mo.gov>, Rich Kapuscinski/DC/USEPA/US@EPA
From: "Paul Rosasco" <paulrosasco@emsidenver.com>
Date: 04/16/2011 02:52PM
Cc: "'Merrigan, Jessie'" <JMerrigan@LathropGage.com>, "'Whitby, Kathleen'" <kwhitby@spencerfane.com>, <VWarren@republicservices.com>, "'Charlotte Neitzel'" <Charlotte.Neitzel@hro.com>, "'Dan Feezor'" <dfeezor@feezorengineering.com>, "'Mike Bollenbacher'" <mikeb@auxier.com>, "'Bob Jelinek'" <bobjelinek@emsidenver.com>
Subject: Responses to EPA Risk Assessment Comments
The attached files address the following risk assessment related comments

EPA Specific Comments 24, 31, 33, 39 and 46

EPA Risk Assessment Comments 1 though 40(contained in two separate zip files sorted by long-term and short-term risk evaluations)

EPA Additional Comments 48, 49, 50 and 51

MNDR Risk Assessment Comments 118 through 138

********** ATTACHMENT NOT DELIVERED **********

This Email message contained an attachment named
EPA Appendix F Long Term Risk Comments.zip, EPA Appendix F Short-term Risk Comments.zip, MDNR Appendix F Comments.zip
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********** ATTACHMENT NOT DELIVERED **********

[attachment "EPA 33 - Risks to the Public.docx" removed by Dan Gravatt/R7/USEPA/US]
[attachment "EPA 46 - Ionizing Radiation.doc" removed by Dan Gravatt/R7/USEPA/US]
[attachment "EPA 24" removed by Dan Gravatt/R7/USEPA/US]
[attachment " 31 & 39 - Long-Term Risk Calculations.doc" removed by Dan Gravatt/R7/USEPA/US]
[attachment "EPA Additional Comment #48 Screening level selection.docx" removed by Dan Gravatt/R7/USEPA/US]
[attachment "EPA Additional Comment #49 Using RESRAD for cover materials #Template.docx" removed by Dan Gravatt/R7/USEPA/US]
[attachment "EPA Additional 51 - Risk Calculations.doc" removed by Dan Gravatt/R7/USEPA/US]
[attachment "EPA Additional 50 - Risk Calculations.doc" removed by Dan Gravatt/R7/USEPA/US]


EPA Appendix F #20 RESRAD default parameters Off-site.docx


EPA Appendix F #21 Typo add be after might .docx


EPA Appendix F #22 Interpretation of offsite exhibits.docx


EPA Appendix F #23 GeoLiner in Risk Calcs.docx


EPA Appendix F #24 Source term onsite.docx


EPA Appendix F #25 RESRAD default parameters Onsite.docx


EPA Appendix F #26 Interpretation of onsite Exhibits.docx


EPA Appendix F #28 Editorial D vs dtrs.docx


EPA Appendix F #01 Exponential Notation.docxEPA Appendix F #02 Typo Content for Context.docx


EPA Appendix F #03 Typo Delete are.docxEPA Appendix F #04 Typo delete parens.docx


EPA Appendix F #05 COC Screening.docxEPA Appendix F #06-09 Chem Carc. and Tox Writeup.docx


EPA Appendix F #10 Equation Pedigree.docxEPA Appendix F #11 Cover descriptions.docx


EPA Appendix F #12 Missing footnote.docxEPA Appendix F #13 ROD source term.docx


EPA Appendix F #14 RESRAD defult parameters ROD.DOCXEPA Appendix F #15 Explain Exhibits.docx


EPA Appendix F #16 RESRAD Exhibits.docxEPA Appendix F #17 Verbal description of RIM extent.docx


EPA Appendix F #18 Remove rock layer.docxEPA Appendix F #19 Trash layer in cover offsite.docx

EPA Appendix F - Risk Assessment # 20

Comment:

Section 6.5.1: See Risk Assessment comment 14 above. (Comment #14: Section 5.5.1: In its justification on page 11 for the use of RESRAD, the SFS describes the similarities between the results obtained using EPA's methodology and RESRAD when the exposure parameters used "were consistent with the exposure parameters on the EPA website." Yet the text on page 19 notes that, with the exception of the parameters in Table 5-2, "all other RESRAD input variables were left at their default values." The SFS would benefit from some discussion of how EPA's exposure parameters were taken into account in the RESRAD evaluation.)

Discussion:

A discussion of the general approach used to calculated risks and doses from covered RIM was provided in Section 4.3.4.3 of Appendix F (in this new version, the section has been changed to Section 4.2.4.3). The use of RESRAD in the draft SFS was limited to the evaluation of risks from buried RIM via the direct radiation and radon-222 pathways. RESRAD was used for no other risk assessment calculation in the Appendix. (It is used for calculation of TEDE in the short-term risk assessments.)

Parameters that were used in calculating risks and doses from irradiation and radon emanation were changed to match similar EPA exposure parameter values for its outdoor worker scenario. Parameters describing other forms of environmental transport or other exposure mechanisms were left at their default values for all RESRAD simulations. Because these values were not used during the simulations, they would not impact the calculated risks results.

The last paragraphs of Section 4.2.4.3 and Section 6.5.1 have been changed in an effort to clarify the use and impact of default parameter values used to calculate risk and dose from covered RIM.

Proposed Text Change:

The last paragraph of Section 4.2.4.3 now reads:

"As stated in previous sections, radiocarcinogenic risks involving exposures to surface soils were calculated using results obtained from the EPA's web-based PRG calculator. Risks from covered materials are not addressed by the EPA PRG calculator, and the ROD-Selected Remedy and the proposed "Complete Rad Removal" alternatives would leave covered materials on the Site. RESRAD was used to calculate risks only from radiation exposures from covered materials and to radon emanating from covered materials."

The last paragraph of Section 6.5.1 now reads:

"Because there will be no exposed waste after construction in this alternative, RESRAD was used to quantify carcinogenic risks from the direct radiation and radon pathways. The exposure factors listed in Table 6-3 describe the RME receptor considered. Table 6-4 lists the scenario-specific information used in this simulation. Parameters describing other forms of environmental transport or other exposure mechanisms were left at their default values. These parameters were not used during the calculation and changing their values would not impact the calculated risks."

EPA Appendix F - Risk Assessment #21:

Comment:

Section 6.6, fourth sentence: Insert the word "be" after "might."

Discussion:

Agreed.

Proposed Text Change:

In information contained in Section 6.6 has been dispersed and incorporated into different sections in the current version of the Appendix. As such, the Section entitled "Sources of Uncertainty" no longer exists in the revised draft of Appendix F.

EPA Appendix F - Risk Assessment # 22

Comment:

Exhibits 6-1 through 6-8: See Risk Assessment comment 15 above. (Comment # 15: Section 5.5.2: The first paragraph on page 20 states that "A more detailed presentation of the long-term risks and doses are presented in Exhibits 5-1 through 5-4." These exhibits appear to be RESRAD printouts, but there is no explanation of how the results are to be read or interpreted. If the public is expected to be able to read and understand these exhibits, then some explanation will be required.)

Discussion:

Additional text will be added explaining the information presented in the Exhibits.

Proposed Text Change:

Section 6.5.2 has been expanded to include the following text:

"Long-term risks and doses are presented in Exhibits 6-1 through 6-4. The odd-numbered Exhibits 6-1 and 6-3 contain excerpts of the output files generated by RESRAD's dose calculation subroutines. Doses at year 1 and year 1,000 are listed at the top of the exhibits. These are followed by the values used to represent the physical characteristics and concentrations of radionuclides in the RIM and cover layer for the area modeled. The central table in the dosimetry exhibit presents the calculated doses to the receptor at selected times. The figure at the bottom of the exhibit presents the calculated doses over time in graphical form. The even-numbered exhibits (Exhibit 6-2 and 6-4) contain excerpts of the output files generated by RESRAD's risk calculation subroutines. Risks at year 1 and year 1,000 are listed at the top of the exhibits. Summary tables listing calculated risks by nuclide and pathway are located in the center of the exhibits. The figure at the bottom of the exhibits presents risks over the evaluation period."

EPA Appendix F - Risk Assessment # 23

Comment:

Section 7.2.1: The physical configuration of the on-site cell cap in this section does not exactly match the configuration in the text and on Figure 15, in that the geomembrane is not included here.

In addition, the proposed sand layer represents a plane of weakness which could compromise the cap's integrity over the design life of the cap. Once the cap configuration is agreed upon, this risk assessment may need to be revised.

Discussion:

The geomembrane was intentionally excluded from Figure 7-1. The effectiveness of the synthetic geomembrane over the 1,000 years was uncertain and only natural components of the cover design were included in the evaluation. The text has been changed to include the rational for the geomembrane's exclusion.

Proposed Text Change:

Section 7.2.1 now reads:

"The physical configuration of the on-site disposal cell after completion of the remedy is summarized below:

- The contaminated material in Areas 1 and 2 have been moved to an engineered disposal cell.
- The material in the engineered disposal cell will be covered by a two-foot layer of rock/rubble.
- The rock/rubble layer in the engineered disposal cell will be covered by a 1.0 (0.3 m) foot thick clay layer with a minimum of 10^{-7} m/s (10^{-5} cm/s) permeability.
- The clay layer in the engineered disposal cell will be covered by a one-foot layer of sand.
- The sand layer in the engineered disposal cell will be covered by a two-foot layer of soil.
- The engineered disposal cell will be vegetated.
- The vegetation on the surface of the engineered disposal cell will be maintained.

Figure 7-1 depicts a stylized cross-section of the on-site engineered disposal cell's cover. A geomembrane is included in the engineered cover design, but it is not reproduced in this conceptual cross-section. The longevity of this membrane is uncertain and the membrane was not considered during the calculation of long-term risks. The conceptual models of the RIM below cleanup levels in Areas 1 and 2 after removal of RIM are identical to those presented in Section 6.2.1.

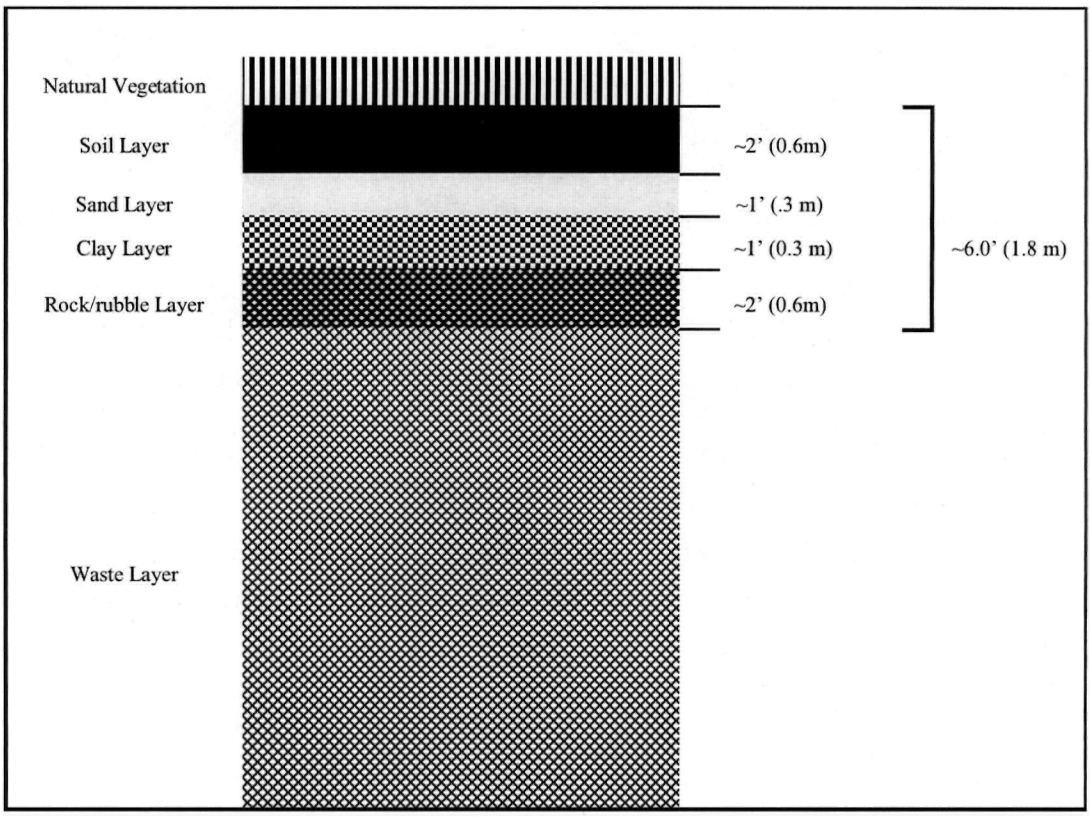

Figure 7-1 Stylized Cross-Section of the On-site Cell "

EPA Appendix F - Risk Assessment # 24

Comment:

Section 7.3: In the first bullet of this section, the source term should include the new on-site disposal cell in addition to Areas 1 and 2.

Discussion:

Agreed.

Proposed Text Change:

Section 7.3 now reads:

"This section contains quantitative descriptions of the RIM, exposure pathways, and receptors evaluated in this assessment. It also includes descriptions of the methods used to calculate potential human exposures from radionuclides in the on-site cell.

The description of the exposure assessment has been divided into three parts:

- Quantitative description of the RIM inventory in the engineered on-site cell, Area 1 and Area 2,
- Identification of the receptor most likely to receive the highest exposures from the RIM beneath the cover, and
- Estimating the exposure point concentrations at the receptor location."

EPA Appendix F - Risk Assessment # 25.

Comment:

Section 7.5.1: See Risk Assessment comment 14 above. (Comment #14: Section 5.5.1: In its justification on page 11 for the use of RESRAD, the SFS describes the similarities between the results obtained using EPA's methodology and RESRAD when the exposure parameters used "were consistent with the exposure parameters on the EPA website." Yet the text on page 19 notes that, with the exception of the parameters in Table 5-2, "all other RESRAD input variables were left at their default values." The SFS would benefit from some discussion of how EPA's exposure parameters were taken into account in the RESRAD evaluation.)

Discussion:

A discussion of the general approach used to calculated risks and doses from covered RIM was provided in Section 4.3.4.3 of Appendix F (in this new version, the section has been changed to Section 4.2.4.3). The use of RESRAD in the draft SFS was limited to the evaluation of risks from buried RIM via the direct radiation and radon-222 pathways. RESRAD was used for no other risk assessment calculation in the Appendix. (It is used for calculation of TEDE in the short-term risk assessments.)

Parameters that were used in calculating risks and doses from irradiation and radon emanation were changed to match similar EPA exposure parameter values for its outdoor worker scenario. Parameters describing other forms of environmental transport or other exposure mechanisms were left at their default values for all RESRAD simulations. Because these values were not used during the simulations, they would not impact the calculated risks results.

The last paragraphs of Section 4.2.4.3 and Section 7.5.1 have been changed in an effort to clarify the use and impact of default parameter values used to calculate risk and dose from covered RIM.

Proposed Text Change:

The last paragraph of Section 4.2.4.3 now reads:

"As stated in previous sections, radiocarcinogenic risks involving exposures to surface soils were calculated using results obtained from the EPA's web-based PRG calculator. Risks from covered materials are not addressed by the EPA PRG calculator, and the ROD-Selected Remedy and the proposed "Complete Rad Removal" alternatives would leave covered materials on the Site. RESRAD was used to calculate risks only from radiation exposures from covered materials and to radon emanating from covered materials."

The last paragraph of Section 7.5.1 now reads:

"Because there will be no exposed waste after construction in this alternative, RESRAD was used to quantify carcinogenic risks from these two pathways. The RIM concentrations used to represent the on-site cell's contents are listed in Table 7-1. The exposure factors listed in Table 7-3 describe the RME receptor considered. Table 7-4 lists the scenario-specific information used in this simulation. Parameters describing other forms of environmental transport or other exposure mechanisms were left at their default values. These parameters were not used during the calculation and changing their values would not impact the calculated risks."

EPA Appendix F - Risk Assessment #26.

Comment:

Exhibits 7-1 and 7-2: See Risk Assessment comment 15 above. (Comment #15: Section 5.5.2: The first paragraph on page 20 states that "A more detailed presentation of the long-term risks and doses are presented in Exhibits 5-1 through 5-4." These exhibits appear to be RESRAD printouts, but there is no explanation of how the results are to be read or interpreted. If the public is expected to be able to read and understand these exhibits, then some explanation will be required.)

Discussion:

Additional text will be added explaining the information presented in the Exhibits.

Proposed Text Change:

Section 7.5.2 has been expanded to include the following text:

"Long-term doses and risks are presented in Exhibits 7-1 and 7-2. Exhibit 7-1 contains excerpts of the output files generated by RESRAD's dose calculation subroutines. Doses at year 1 and year 1,000 are listed at the top of the Exhibit. These are followed by the values used to represent the physical characteristics of the cell contents and cover layer and the concentrations of radionuclides in the RIM after it has been placed in the cell. The central table in the dosimetry exhibit presents the calculated doses to the receptor at selected times. The figure at the bottom of the exhibit presents the calculated doses over time in graphical form. Exhibit 7-2 contains excerpts of the output files generated by RESRAD's risk calculation subroutines. Risks at year 1 and year 1,000 are listed at the top of the Exhibits. Summary tables listing calculated risks by nuclide and pathway are located in the center of the exhibits. The figure at the bottom of the exhibits presents risks over the evaluation period."

EPA Appendix F – Risk Assessment #28:

Comment:

Tables 8-2, 8-3 and 8-4: The abbreviation "D" is used for several radionuclides in this table and appears to have the same meaning as the "dtrs" abbreviation used earlier in the document. These abbreviations should be made consistent. "D" is also used in Tables 9-2, 9 -3, 9-4, 10-2, 10-3, and 10-4.

Discussion:

Agreed.

Proposed Text Change:

The use of the two formats will be standardized throughout the Appendix. All tables have been changed to read "dtrs" and not "D". This change affects large portions of the document. New text will be available for review when the final SFS is issued.

EPA Appendix F - Risk Assessment #1:

General Comment:

Exponential notation throughout this Appendix uses two different formats (e.g., 1x10-6 and 1E-06). One common notation format should be used throughout.

Discussion:

The use of the two formats will be standardized throughout the Appendix. Ten to the power of n (e.g. $1x10^{-6}$) is consistent with most EPA publications. All exponential notation will be changed to this format.

Proposed Text Change:

All exponential notations in Appendix F are now in the 1×10^{-6} notation throughout the text and tables consistently. This change affects large portions of the document. New text will be available for review when the final SFS is issued.

EPA Appendix F – Risk Assessment #2:

Comment:

Section 1: In the last sentence describing the ROD remedy, the word "context" should be "contact."

Discussion:

Agreed.

Proposed Text Change:

Section 1 of Appendix F has been revised and the sentence that this comment refers to no longer exists.

The text from Appendix F describing the ROD remedy now reads:

> **"The remedy prescribed in the Record of Decision (ROD) -** Under this alternative, the RIM would remain in place and improvements would be made to the Site as specified in the ROD. This design protects human health and the environment by using an engineered cap to cover the RIM and isolate the radioactive material from human receptors and the environment."

EPA Appendix F – Risk Assessment #3:

Comment:

Section 3, second paragraph: In the second sentence, the word "are" should be deleted.

Discussion:

Agreed.

Proposed Text Change:

The text of Section 3 in its entirety now reads:

"The risk assessments in this SFS build on the baseline risk assessment (BRA) (Auxier 2000), as exposure scenarios are still applicable to the Site and its surroundings. A search of literature and on-line databases was performed to determine if significant changes had occurred that would affect the exposures or risks calculated in the BRA.

No physical changes have been made to Areas 1 and 2, and there is no reason to suspect that the nature and extent of the radiologically-impacted material (RIM) has changed since the BRA was published. Descriptions of the Site and its surroundings contained in the FS (EMSI 2006) were compared to the descriptions in the BRA and no new information was found that would impact the types and magnitudes of exposures and risks described in the BRA.

Updated information regarding toxicity, dose conversion factors, and cancer slope factors gathered from EPA's IRIS database and risk assessment websites were incorporated in this evaluation to assure that the risk assessments represent the best and most current possible evaluation of all risks. This toxicity information is presented in more detail in Section 4.2.3."

EPA Appendix F - Risk Assessment #4:

Comment:

Section 4.1, first paragraph: In the last sentence, the parentheses should be removed from the figure of 95 percent.

Discussion:

Agreed.

Proposed Text Change:

The text from Section 4.1 in its entirety now reads:

"In 2000 Auxier & Associates, Inc. completed a baseline risk assessment (BRA) for OU-1. This BRA included two areas (Radiological Areas 1 and 2) where RIM is present at the Site (Auxier 2000). This assessment used EPA methodology to calculate risks to a variety of potential receptors assuming no corrective action was taken at the Site. The BRA determined that the reasonably maximally-exposed (RME) individual was a hypothetical on-site worker in Area 2. The total calculated risk to this RME would be approximately 4×10^{-4} with 95% of the risk attributable to exposure to radiation from Ra-226 and its daughters in surface soil.

Health effects from three remedial alternatives are evaluated in this Appendix. In order to avoid repetition, methods and risk information that are common to all three alternatives are presented in the remainder of this section."

EPA Appendix F - Risk Assessment #5:

Comment:

Table 4-2: Footnote "a" states that screening levels used in the risk evaluation are from the EPA Region 9 screening tables. Please note that the Region 9 screening levels were replaced in September 2008 by the EPA Regional Screening Levels. The most recent update of the screening levels took place in May 2010. Consequently, several of the risk-based screening levels presented in this table are no longer appropriate for use and should be replaced with the most current values. The current screening tables can be found online at:

http://www.epa.gov/reg3hwmd/risk/human/rbconcentration table/Generic Tables/index.htm

Also, EPA is currently conducting reassessment of hexavalent chromium under the IRIS program (EPA, 2010a). Hexavalent chromium has been considered to be carcinogenic by the inhalation route of exposure for a number of years. However, recent studies have shown that hexavalent chromium should be considered to be carcinogenic by the oral route of exposure as well (NIH, 2007). Furthermore, it appears that hexavalent chromium's carcinogenicity is associated with a mutagenic mode of action (McCarroll, et. al., 2009). EPA currently considers the oral cancer slope factor of 0.5 (mg/kg-d)-1 developed by the state of New Jersey to be a Tier 3 value (EPA, 2003 and 2010b). EPA has recently updated its Regional Screening Tables taking this information into account as well as the mutagenic mode of action and is now recommending screening levels for hexavalent chromium of 0.29 mg/kg in residential soil, 5.6 mg/kg in industrial soil, and 0.043 µg/l in tap water. These new screening levels emphasize the need for chromium sampling to report the results for both trivalent and hexavalent chromium rather than simply a value for total chromium. In order to be conservative, in the absence of hexavalent chromium data, EPA Region 7 will consider all total chromium results to represent hexavalent chromium concentrations (EPA, 2010b). Thus, chromium in this table should be identified as another COPC in the initial contaminant screening process.

Discussion:

The requested changes have been made to Table 4-2. Chromium has been added to the COPC list. Changes in the uranium toxicity screening value result in uranium toxicity being screened out. Individual isotopes of uranium are retained as carcinogens in the new screening table. Aroclor 1254 has also been added to the list of COPCs.

Proposed Text Changes:

"The BRA also performed a toxicity screen of the chemicals that were reported at the Site. This toxicity screen has been updated to account for changes that have occurred since publication of the BRA. Table 4-2 presents the concentrations used in the screening evaluation and the results.

Table 4-2 Summary of Chemical Toxicity Screen for Surface Soil

Analyte	Risk- or HI-Based Industrial Screening Values [a] (mg/kg)	Maximum Soil Concentrations [b] Area 1 (mg/kg)	Maximum Soil Concentrations [b] Area 2 + Boundary (mg/kg)	Selection/Screening of COCs in Soils [c] Area 1 0-1 ft	Selection/Screening of COCs in Soils [c] Area 2 + Boundary 0-1 ft	Screening Result Changed from Baseline?
Inorganic Chemicals						
Arsenic	$1.60x10^{00}$	220	35	**YES**	**YES**	no
Beryllium	$2.00x10^{03}$	3.3	2.2 [f]	no	no	no
Cadmium	$8.00x10^{02}$	7.9	6.3 [f]	no	no	no
Chromium (VI)	$5.60x10^{00}$	31	49 [f]	**YES**	**YES**	**Added**
Copper	$4.10x10^{04}$	2,300	360	no	no	no
Lead	$8.00x10^{02}$	320	2,200	no	**YES**	no
Mercury	$3.40x10^{01}$	0.17	0.27	no	no	no
Nickel	$2.00x10^{04}$	3,600	680	no	no	no
Selenium	$5.10x10^{03}$	250	38	no	no	no
Thallium	$1.40x10^{01}$ [d]	1.2	nr [e]	no	no	no
Uranium	$3.10x10^{03}$	437.5	875	no	no	**Deleted**
Zinc	$3.10x10^{05}$	120	400 [f]	no	no	no
Organic Chemicals						
Acetone	$6.30x10^{05}$	0.034	0.038	no	no	no
Bis(2-ethylhexyl) phthalate	$1.20x10^{02}$	7.8	77	no	no	no
Di-n-octylphthalate	$1.80x10^{03}$ [d]	3	12	no	no	no
1,4-Dichlorobenzene	$1.20x10^{01}$	0.042	0.0065	no	no	no
Fluoranthene	$2.20x10^{04}$	nr	8.5	no	no	no
Xylenes	$2.70x10^{03}$	0.037	0.012	no	no	no
Pesticides/PCBs						
Aldrin	$1.00x10^{-01}$	nr	0.0017	no	no	no
Aroclor-1254	$7.40x10^{-01}$	1.1	1.6	**YES**	**YES**	no
4,4'-DDD	$7.20x10^{00}$ [d]	nr	0.0076	no	no	no
4,4'-DDT	$7.00x10^{00}$	nr	0.0094	no	no	no

[a] Unless otherwise noted, values are from http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/, February 21, 2011. When carcinogenic (risk) and non-carcinogenic (hazard) based screening levels were given for a constituent, the lower of the two was selected.

[b] From Table A.2-1 of the BRA (Auxier 2000)

[c] "YES" signifies that the analyte was selected for quantitative risk evaluation, "no" signifies that analyte was not selected for quantitative risk evaluation.

[d] Value from BRA, no updated information identified.

[e] nr = not reported

[f] Measured on the former Ford property (current Buffer Zone and Crossroad Lot 2A2 properties) before surface grading were performed by the adjacent property owner.

Chromium VI has been added to the list of COCs because its maximum reported concentration exceeds the current published screening level of 5.6 mg/kg.[1] The current screening level published for elemental uranium has increased since publication of the BRA. The maximum concentration of elemental uranium is now below the current EPA Regional Screening Level of 3,100 mg/kg and elemental uranium has been removed from non-carcinogenic evaluations (individual isotopes of uranium remain as COCs because they are radiocarcinogens)."

[1] http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/

EPA Comments Pertaining to Toxicity Section of Risk Assessment

EPA Appendix F – Risk Assessment #6:

Comment:

Section 4.3.3: The risk calculator web sites maintained by EPA should be referenced here.

EPA Appendix F - Risk Assessment #7:

Comment:

Table 4-4: Arsenic has an inhalation unit risk value of 4.3E-03 $(\mu g/m^3)^{-1}$. Also, EPA considers the dermal slope factors of carcinogens to be equal to their oral slope factors based on the recommended approach in RAGS Part E (EPA, 2004).

EPA Appendix F - Risk Assessment #8:

Comment:

Table 4-5: EPA considers the dermal reference doses for arsenic and uranium to have the same values as their oral reference doses based on the recommended approach in RAGS Part E (EPA, 2004).

EPA Appendix F - Risk Assessment #9:

Comment:

Tables 4-4 and 4-5: Superscript "a" is defined as referring to two toxicity databases. It would be helpful to instead use more than one superscript to denote which value, for which chemical, is derived from IRIS or from HEAST. Is it correct to cite Auxier (2000) as the reference for HEAST as noted in this footnote?

Discussion:

Section 4.3.3 has moved in this new version of Appendix F. The toxicity section is now in Section 4.2.3. The requested changes have been made to Table 4-3, 4-4, and Table 4-5. The footnotes have been revised and now cite the information used by EPA to prepare the soils screening values in Table 4-2 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/).

Proposed Text Changes:

The entire revised Section 4.2.3 now reads:

4.2.3 Toxicity Assessment

The radionuclides selected for evaluation have not changed from those listed as constituents of concern in the BRA. The chemicals of concern (COCs) have changed, based on the latest screening values (Table 4-2). This COC list is common to all alternatives.

4.2.3.1 Radiocarcinogens

EPA methodology relies on slope factors to convert the intake of radionuclides to risk. Slope factors for radionuclides have changed since the BRA was published. Slope factors for radionuclides of concern as of February 21, 2011 are listed in Table 4-3.

Table 4-3 Radiocarcinogenic Slope Factors

Radionuclide	Inhalation Slope Factor (risk/pCi)	Adult Soil Ingestion Slope Factor (risk/pCi)	Planer Soil External Exposure Slope Factor (risk/yr per pCi/g)	Submersion External Exposure Slope Factor (risk/yr per pCi/m^3)
Uranium Series				
Uranium 238 + 2 dtrs	$9.35x10^{-09}$	$5.62x10^{-11}$	$1.14x10^{-07}$	$1.22x10^{-10}$
Uranium 234	$1.14x10^{-08}$	$5.11x10^{-11}$	$2.52x10^{-10}$	$5.10x10^{-13}$
Thorium 230	$2.85x10^{-08}$	$7.73x10^{-11}$	$8.19x10^{-10}$	$1.31x10^{-12}$
Radium 226 + 10 dtrs	$1.44x10^{-08}$	$8.94x10^{-10}$	$8.49x10^{-06}$	$7.87x10^{-09}$
Radon 222 + 6 dtrs	$1.80x10^{-11}$	none	$8.48x10^{-06}$	$7.85x10^{-09}$
Actinium Series				
Uranium 235 + 1 dtr	$1.01x10^{-08}$	$5.01x10^{-11}$	$5.44x10^{-07}$	$6.34x10^{-10}$
Protactinium 231 + 8 dtrs	$2.55x10^{-07}$	$4.99x10^{-10}$	$2.03x10^{-06}$	$2.12x10^{-09}$
Thorium Series				
Thorium 232 + 10 dtrs	$1.81x10^{-07}$	$8.19x10^{-10}$	$1.23x10^{-05}$	$1.14x10^{-08}$

Note: Slope factor values list on this table were obtained on February 21, 2011 from http://epa-prgs.ornl.gov/cgi-bin/radionuclides/rprg_search.

4.2.3.2 Carcinogenic Chemicals

Updated oral slope factors and inhalation unit risks for chemicals of concern are listed Table 4-4.

Table 4-4 Carcinogenic Chemical Slope Factors

Chemical	CAS	Oral Slope Factor [a] (kg-day/mg)	Inhalation Unit Risk [a] (m^3/µg)
Aroclor-1254	011097-69-1	$2.0\ x10^{00}$	$5.71x10^{-04}$
Arsenic, Inorganic	007440-38-2	$1.50x10^{00}$	$4.30x10^{-03}$
Chromium (VI)	018540-29-9	$5.00x10^{-01}$	$8.40x10^{-02}$
Lead and Compounds	007439-92-1	ND [b]	ND [b]

[a] http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/, February 21, 2011.

[b] ND signifies that data were not defined. EPA uses modeled blood concentrations to evaluate potential health effects from lead exposures.

4.2.3.3 Non-Carcinogenic Chemicals

Information about health effects from chronic exposures to chemicals has changed since publication of the BRA in 2000. The latest information is publicly available at http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm. On February 21, 2011, updated values for chemical toxicity were retrieved from this site. Those values are reproduced in Table 4-5.

Table 4-5 Non-Carcinogenic Reference Quantities

Chemical	CAS	Chronic Oral Reference Dose [a] (mg/kg-day)	Chronic Inhalation Reference Concentration [a] (mg/m^3)
Aroclor-1254	011097-69-1	$2.00x10^{-05}$	-
Arsenic, Inorganic	007440-38-2	$3.00x10^{-04}$	$1.50x10^{-05}$
Chromium (VI)	018540-29-9	$3.00x10^{-03}$	$1.00x10^{-04}$
Lead and Compounds	007439-92-1	ND [b]	ND [b]

[a] http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/, February 21, 2011.

[b] ND signifies that data were not defined. EPA uses modeled blood concentrations to evaluate potential health effects from lead exposures.

EPA Appendix F - Risk Assessment # 10:

Comment:

Section 4.3.4.1: The text identifies the equation on this page as being applicable to an outdoor worker. However, the subscripts are those for an indoor worker. The actual numerical values which appear in the following equation appear to be correct.

Discussion:

The equations have been updated.

Proposed Text Change:

Section 4.3.4.1 has moved in this new version of Appendix F. The "Risk Assessment Method Used for Exposed RIM in this Study" now resides as Section 4.2.4.1.

The cited text in Section 4.2.4.1 now reads:

"Radiocarcinogenic risks involving contact with surface soils were calculated using results obtained from the EPA's web-based preliminary remediation goal (PRG) calculator[1] and supporting formulas published in the associated user's guide.[2] The user's guide lists three PRG equations to calculate preliminary remediation goals for radiocarcinogens in surface soil, one for each exposure route. If incidental ingestion of surface soil is the only exposure route considered, the PRG equation is:

$$PRG_{ow\text{-}soil\text{-}ing}(pCi/g)=\frac{TR\times t_{ow}(yr)\times\lambda\left(\frac{1}{yr}\right)}{\left(1-e^{-\lambda t_{ow}}\right)\times SF_s\left(\frac{risk}{pCi}\right)\times IRS_{ow}\left(\frac{100\ mg}{day}\right)\times EF_{ow}\left(\frac{225\ day}{yr}\right)\times ED_{ow}(25\ yr)\times\left(\frac{g}{1000\ mg}\right)}$$

If inhalation of suspended surface soil particles is the only exposure route considered, the PRG equation is:

---

[1] http://epa-prgs.ornl.gov/cgi-bin/radionuclides/rprg_search

[2] http://epa-prgs.ornl.gov/radionuclides/prg_guide.shtml

$$PRG_{ow\text{-}sol\text{-}inh}(pCi/g)=\frac{TR\times t_{ow}(yr)\times\lambda\left(\frac{1}{yr}\right)}{\left(1-e^{-\lambda t_{ow}}\right)\times SF_i\left(\frac{risk}{pCi}\right)\times IRA_{ow}\left(\frac{60\ m^3}{day}\right)\times EF_{ow}\left(\frac{225\ day}{yr}\right)\times ED_{ow}(25\ yr)\times\frac{1}{PEF\left(\frac{m^3}{kg}\right)}\times ET_{ow}\left(\frac{8\ hr}{day}\right)\times\left(\frac{1\ day}{24\ hr}\right)\times\left(\frac{1000\ g}{kg}\right)}$$

If direct exposure to external radiation from bare surface soil is the only exposure route considered, the PRG equation is:

$$PRG_{ow\text{-}sol\text{-}ext}(pCi/g)=\frac{TR\times t_{ow}(yr)\times\lambda\left(\frac{1}{yr}\right)}{\left(1-e^{-\lambda t_{ow}}\right)\times SF_{ext\text{-}sv}\left(\frac{risk/yr}{pCi/g}\right)\times ACF\times EF_{ow}\left(\frac{225\ day}{yr}\right)\times\left(\frac{1\ yr}{365\ day}\right)\times ED_{ow}(25\ yr)\times ET_{ow}\left(\frac{8\ hr}{day}\right)\times\left(\frac{1\ day}{24\ hr}\right)\times GSF(1.0)}$$

If all three of the previously mentioned exposure routes are considered, the following equation is used to combine the results of the previous three PRG equations:

$$PRG_{ow\text{-}sol\text{-}tot}(pCi/g)=\frac{1}{\frac{1}{PRG_{ow\text{-}sol\text{-}ing}}+\frac{1}{PRG_{ow\text{-}sol\text{-}inh}}+\frac{1}{PRG_{ow\text{-}sol\text{-}ext}}}$$

Using a target risk (TR) of 10^{-6} and the EPA web calculator's default parameters for outdoor work exposures, it can be determined that the PRG for radium-226 and its short-lived daughters in soil from all three exposure routes is 0.0248 pCi/g. Stated another way, every pCi/g of radium-226 in soil can increase the calculated risk of cancer to the hypothetical outdoor receptor by approximately 4.0×10^{-5} (10^{-6} / 0.0248, rounded to one significant figure). The EPA web calculator also provides PRGs for individual exposure routes. In this example, the PRG for the external exposure pathway is 0.0249 pCi/g, indicating exposures to direct radiation from radium and its daughters in surface soil contribute approximately 99.6% of the risk to the receptor.

In this SFS, risks to specific workers from surface soil will be evaluated using the method presented on the EPA website and illustrated above. However, assessment of carcinogenic risks to individual types of workers identified during the scheduling and manpower evaluation stages of this study may require job-specific changes in parameters such as exposure time and duration. Changes in these parameters and their justifications will be presented as part of the risk evaluation for those jobs. Because these changes to worker exposure times and durations are linear in nature, the risk result will change linearly with changes in concentrations or exposure

times. For example, if the calculated risk from 45,000 hours[3] of exposure to soil containing 1 pCi/g of radium-226 is 4.0×10^{-5}, then exposure to the same soil for only one hour will be $1/45{,}000^{th}$ of that risk or 8.9×10^{-10} per pCi/g per hour and a 1,000 hour exposure would yield a calculated risk of 8.9×10^{-7}."

[3] http://epa-prgs.ornl.gov/cgi-bin/radionuclides/rprg_search. EPA's outdoor worker receptor assumes the worker is present for 8 hours a day, 225 days/year for 25 years, or 25 years x 225 days/year x 8 hour/day = 45,000 hours of exposure.

EPA Appendix F - Risk Assessment # 11:

Comment:

Section 5.3.1, third bullet: The "rock and clay layer" described here appears to be referred to as the "biointrusion layer" in Figure 5-1. These names should be made consistent. This inconsistency also occurs in Section 7.2.1 and Figure 7-1.

Discussion:

Agreed. All cross-sections in the risk assessment and the corresponding text have been revised.

Proposed Text Changes:

Section 5.2.1 and 7.2.1 have been revised to read:

"5.2.1 Physical Setting

The physical configuration of the Site after completion of the remedy is summarized below:

- The contaminated material in Area 1 remains the same as in the description published in the BRA. The contaminated material from the Ford property has been consolidated into Area 2 and is below the cap. This will add approximately 3,500 cubic yards of RIM to Area 2.
- Areas 1 and 2 will be graded to improve the drainage characteristics of the final cover.
- A rock and/or concrete rubble will be placed over the RIM in Areas 1 and 2. This rock/rubble layer will be two-feet thick.
- Clay caps will be placed over the rock layer to minimize precipitation infiltration into the underlying waste materials and to attenuate radon emissions from the RIM. The thickness of the clay cap in Areas 1 and 2 will be 2 feet (0.6 m). The permeability of this clay will be a minimum of 10^{-7} m/s (10^{-5} cm/s).
- Areas 1 and 2 will be covered with one foot of soil and a vegetative cover will be established on the cap. This vegetative cover is assumed to be maintained to prevent depletion of the cap.

Figure 5-1 depicts the cap design for Areas 1 and 2.

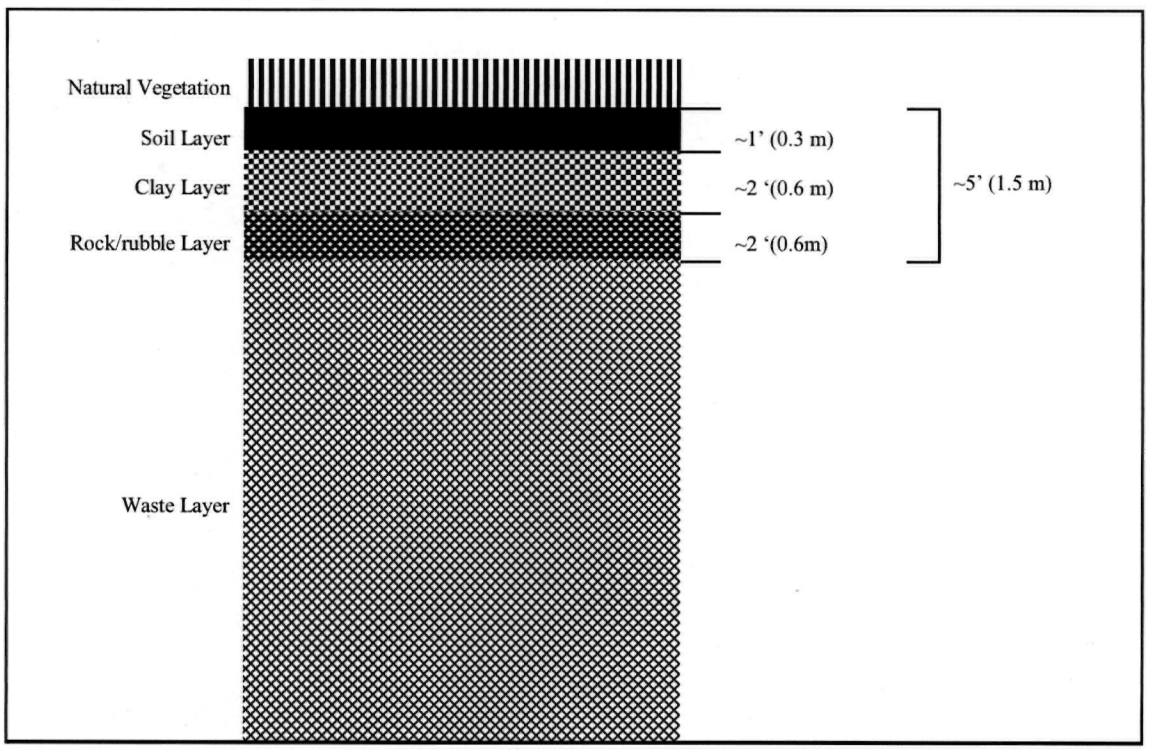

Figure 5-1 Stylized Cross-Section of Area 1 after the ROD-Selected Remedy

7.2.1 Physical Setting

The physical configuration of the on-site disposal cell after completion of the remedy is summarized below:

- The contaminated material in Areas 1 and 2 have been moved to an engineered disposal cell.
- The material in the engineered disposal cell will be covered by a two-foot layer of rock/rubble.
- The rock/rubble layer in the engineered disposal cell will be covered by a 1.0 (0.3 m) foot thick clay layer with a minimum of 10^{-7} m/s (10^{-5} cm/s) permeability.
- The clay layer in the engineered disposal cell will be covered by a one-foot layer of sand.
- The sand layer in the engineered disposal cell will be covered by a two-foot layer of soil.
- The engineered disposal cell will be vegetated.
- The vegetation on the surface of the engineered disposal cell will be maintained.

Figure 7-1 depicts a stylized cross-section of the on-site engineered disposal cell's cover. A geomembrane is included in the engineered cover design, but it is not reproduced in this conceptual cross-section. The longevity of this membrane is uncertain and the membrane was not considered during the calculation of long-term risks. The conceptual models of the RIM below cleanup levels in Areas 1 and 2 after removal of RIM are identical to those presented in Section 6.2.1.

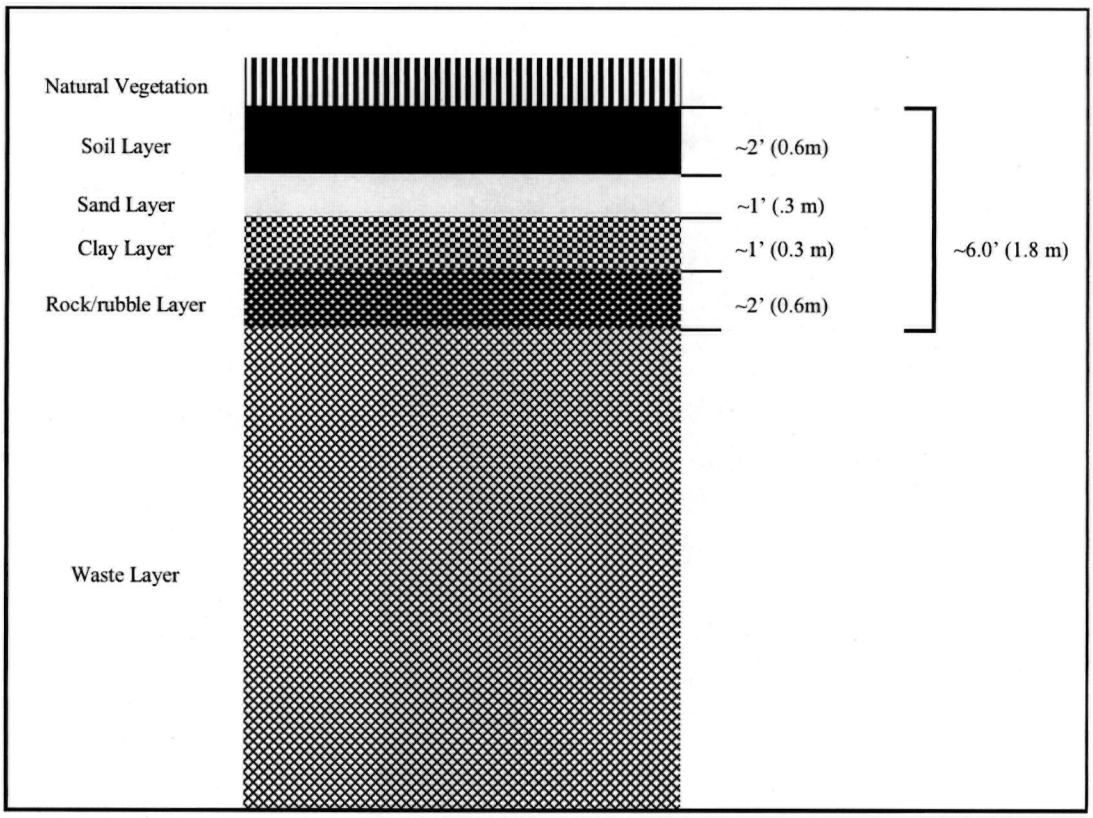

Figure 7-1 Stylized Cross-Section of the On-site Cell "

EPA Appendix F - Risk Assessment # 12.

Comment:

Section 5.3.1.2, second bullet: This bullet refers to footnote 7, but the footnote is missing and must be included.

Discussion:

The footnote is a typo and will be deleted in the next revision of the Appendix.

Proposed Text Change:

Section 5.3.1.2 now reads:

"The concentrations of the radionuclides in the RIM are expected to change over the course of 1,000 years due to radiological decay and in-growth[1]. Future concentrations over the next 1,000 years were calculated using the following assumptions:

- The future RIM is unaffected by chemical degradation during the study period of 1,000 years.
- Radiological decay and associated daughter in-growth over 1,000 years will change the concentrations of the radionuclides in a predictable manner.

The representative concentrations used in this risk assessment are listed in Table 5-1. The 1,000 year values include the effects of radioactive in-growth and decay for radionuclides."

[1] A 1,000 year study period was selected based on design requirements of 40 CFR 192.

EPA Appendix F - Risk Assessment #13.

Comment:

Table 5.1: A comparison of Table 5.1 with Tables A.3-2 and A.3-5 in the BLRA shows that the exposure point concentrations for Area 1 used in the SFS are based on the 95 percent DCL of sample results from "all depths." However, Equation A.3-5, and the text in Section A.5.2.1, of the BLRA seem to indicate that "surface soil" was evaluated in the BLRA. Also, the surface soil exposure concentrations in Tables A.3-2, A.3-3, A.3-5, and A.3-6 of the BLRA are higher than those for all depths. Given this, it seems as though an evaluation of the surface "soils in the SFS would have been a more conservative approach. The SFS could benefit from some discussion as to how the exposure point concentrations were selected for evaluation.

Also, we noticed that the exposure point concentrations for Area 2 in Tables A.3-3 and A.3-6 of the BLRA are slightly different than the exposure point concentrations which appear in Table 5-1. An explanation of these differences would be helpful to the reader.

Discussion:

Data from all depths were used because it is representative of all the waste contained beneath the proposed cover. This will be clarified in the text.

The 1,000 year source term for Area 2 in Table 5-1 reflected the impact of mixing remediated material from the Crossroads property with the materials already in Area 2. The approach used to "average" the two datasets has been reviewed in response to this comment. The approach was appropriate, but introduced additional complexities and uncertainties into the inventory. Rather than expand the explanation of its derivation, the 1,000 year inventory will be calculated using the Area 2 inventory without the additional material from the Crossroads property. This will increase the risks slightly and simplify the explanation in the text.

Proposed Text Change:

Section 5.3.1.1 and Table 5-1 have been changed and now read:

"5.3.1.1 Concentrations of COCs in RIM 1 Year after Remedy

The 95% upper confidence interval (UCL) on the mean for radionuclide and chemical concentrations across all depths was used to represent RIM concentrations in Areas 1 and 2 immediately after remedy construction (Table A.3-3 and Table A.3-4 of the BRA). The two columns of values listed under the "Post-Remedy" heading of Table 5-1 present RIM concentrations in Areas 1 and 2 during and immediately after construction. These concentrations were assumed to be representative of the entire volume of RIM in the respective areas underlying the proposed cover.[1]

Table 5-1 Characterization of RIM in Areas 1 and 2, ROD Remedy

	Post-Remedy		1,000-year		
Radionuclide	**Area 1** [a]	**Area 2** [a]	**Area 1**	**Area 2**	**Units**
Uranium Series					
Uranium-238 + 2 dtrs	16.6	27.1	16.6	27.1	pCi/g
Uranium-234	16.9	46.0	16.9	46.0	pCi/g
Thorium-230	1,060	3,730	1,051	3,697	pCi/g
Radium-226 + 5 dtrs	71.6	338	417 [b]	1,523 [b]	pCi/g
Lead-210 + 2 dtrs	88.6	128	417	1,523	pCi/g
Actinium Series					
Uranium-235 + 1 dtr	0.84 [c]	1.83 [c]	0.84 [c]	1.83 [c]	pCi/g
Protactinium-231 + 8 dtrs	47.3	162	47.3	162	pCi/g
Thorium Series					
Thorium-232 + 10 dtrs	4.14	15.9	4.14	15.9	pCi/g

[a] Immediately after construction ceases. Used 95% UCL on the arithmetic mean of the RIM concentrations listed in the BRA.

[b] Includes in-growth from the decay of Th-230.

[c] Due to the uncertainty of the U-235 results, these values were calculated using the more reliable U-238 and U-234 results and the expected relative abundance of U-235 in natural uranium. "

[1] Soil removed from the Crossroads property during an interim remedial action will be added to Area 2 during remedy construction. This material contains lower concentrations of RIM and adding it to the material in Area 2 would lower the average concentration in Area 2. Using the unmixed concentrations from Table A.3-4 of the BRA is a simplifying assumption that will increase risks slightly.

EPA Appendix F - Risk Assessment # 14

Comment:

Section 5.5.1: In its justification on page 11 for the use of RESRAD, the SFS describes the similarities between the results obtained using EPA's methodology and RESRAD when the exposure parameters used "were consistent with the exposure parameters on the EPA website." Yet the text on page 19 notes that, with the exception of the parameters in Table 5-2, "all other RESRAD input variables were left at their default values." The SFS would benefit from some discussion of how EPA's exposure parameters were taken into account in the RESRAD evaluation.

Discussion:

A discussion of the general approach used to calculated risks and doses from covered RIM was provided in Section 4.3.4.3 of Appendix F (in this new version, the section has been changed to Section 4.2.4.3). The use of RESRAD in the draft SFS was limited to the evaluation of risks from buried RIM via the direct radiation and radon-222 pathways. RESRAD was used for no other risk assessment calculation in the Appendix. (It is used for calculation of TEDE in the short-term risk assessments.)

Parameters that were used in calculating risks and doses from irradiation and radon emanation were changed to match similar EPA exposure parameter values for its outdoor worker scenario. Parameters describing other forms of environmental transport or other exposure mechanisms were left at their default values for all RESRAD simulations. Because these values were not used during the simulations, they would not impact the calculated risks results.

The last paragraphs of Section 4.2.4.3 and Section 5.5.1 have been changed in an effort to clarify the use and impact of default parameter values used to calculate risk and dose from covered RIM.

Proposed Text Change:

The last paragraph of Section 4.2.4.3 now reads:

"As stated in previous sections, radiocarcinogenic risks involving exposures to surface soils were calculated using results obtained from the EPA's web-based PRG calculator. Risks from covered materials are not addressed by the EPA PRG calculator, and the ROD-Selected Remedy and the proposed "Complete Rad Removal" alternatives would leave covered materials on the Site. RESRAD was used to calculate risks only from radiation exposures from covered materials and to radon emanating from covered materials."

The last paragraph of Section 5.5.1 now reads:

"Because the only potential exposure routes are exposure to direct radiation penetrating the cap and emanation of radon through the cover, RESRAD was used to quantify carcinogenic risks from these two pathways. The RIM concentrations used to represent the sources of potential exposures are listed in Table 5-1. The exposure factors listed in Table 5-3 describe the reasonably maximally-exposed (RME) individual receptor considered. Table 5-4 lists the scenario specific physical information used in this simulation. Parameters describing other forms of environmental transport or other exposure mechanisms were left at their default values. These parameters were not used during the risk calculation and changing their values would not impact calculated risks or doses."

EPA Appendix F - Risk Assessment # 15

Comment:

Section 5.5.2: The first paragraph on page 20 states that "A more detailed presentation of the long-term risks and doses are presented in Exhibits 5-1 through 5-4." These exhibits appear to be RESRAD printouts, but there is no explanation of how the results are to be read or interpreted. If the public is expected to be able to read and understand these exhibits, then some explanation will be required.

Discussion:

Additional text will be added explaining the information presented in the Exhibits.

Proposed Text Change:

Section 5.5.2 has been expanded to include the following text:

"Long-term risks and doses are presented in Exhibits 5-1 through 5-4. Exhibits 5-1 and 5-3 contain excerpts of the output files generated by RESRAD's dose calculation subroutines. Doses at year 1 and year 1,000 are listed at the top of the exhibits. These are followed by the values used to represent the physical characteristics and concentrations of radionuclides in the sources of potential exposure and covers for the area modeled. The central table in the dosimetry exhibit presents the calculated doses to the receptor at selected times. The figure at the bottom of the exhibit presents the calculated doses over time in graphical form. The even numbered exhibits (Exhibit 5-2 and 5-4) contain excerpts of the output files generated by RESRAD's risk calculation subroutines. Risks at year 1 and year 1,000 are listed at the top of the exhibits. Summary tables listing calculated risks by nuclide and pathway are located in the center of the exhibits. The figure at the bottom of the exhibits presents risks over the evaluation period."

EPA Appendix F - Risk Assessment #16:

Comment:

Exhibits 5-1, 5-2, and 7-1: In the "detailed dose data" section, the column headings are missing and should be added. Also, in Exhibit 6-6, the area of Area 2 is incorrectly stated.

Discussion:

The tables in the center of these exhibits are confusing as presented. The column headings are the values for the elapsed time in years. The tables will be reformatted to clarify that the column headings are the values on the t (years) row.

The typo in Exhibit 6-6 has been corrected.

Proposed Text Change:

In the revised version of Appendix F, all the Exhibits have been modified to present a uniform appearance and format. An example of the table changes from Exhibit 5-1 is presented below:

Total Dose TDOSE(t) over 1,000 Year Simulation, mrem/y

Maximum of 1.278×10^{-02} mrem/y at t = 1000 years

t (years):	1	10	100	300	1000
TDOSE(t):	1.13×10^{-03}	1.20×10^{-03}	1.90×10^{-03}	3.68×10^{-03}	1.28×10^{-02}
M(t):	7.45×10^{-05}	7.99×10^{-05}	1.27×10^{-04}	2.54×10^{-04}	8.52×10^{-04}

TDOSE (t) = Total annual dose from all radionuclides in year (t)

M(t) = Fraction of 15 mrem/y received in year (t)

The doses in this table may change if information is updated.

EPA Appendix F - Risk Assessment # 17

Comment:

Section 6.1: This section and subsequent sections of the risk assessment refer to "small quantities", "a thin layer of", or "residual" RIM to be left in Areas 1 and 2 as part of the "complete rad removal" alternatives. This characterization is misleading and appears inconsistent with the main text of the report. The radiological cleanup levels set for Areas 1 and 2 are somewhat above background, and excavating all material above these cleanup standards will leave some RIM with concentrations below the cleanup levels in Areas 1 and 2. EPA recommends using the term "RIM below cleanup levels" consistently throughout this risk assessment to refer to this material.

Discussion:

The term "residual RIM" will be replaced globally throughout Appendix F with "RIM below cleanup levels".

Proposed Text Change:

The proposed text changes have been incorporated into the revised draft of Appendix F. This change affects many pages of the text and specific passages of the text incorporating these changes will not be reproduced here.

EPA Appendix F – Risk Assessment #18:

Comment:

Section 6.2.1, third bullet: The rock layer described in this bullet is missing from Figure 6-1. The text and figure must be reconciled.

Discussion:

The text was has been changed to match the figure.

Proposed Text Change:

The text in Section 6.2.1 and Figure 6-1 has been reconciled and now reads:

"6.2.1 Physical Setting

The physical configuration of the Site after completion of the remedy is summarized below:

- The bulk of the RIM in Areas 1 and 2 has been removed, leaving a layer of RIM at concentrations below cleanup levels and non-RIM wastes.
- A two-foot thick layer of clay will be placed over the waste materials. The permeability of this clay will be a minimum of 10^{-7} m/s (10^{-5} cm/s).
- Areas 1 and 2 will be covered with one foot of soil and a vegetative cover will be established on the cap. This vegetative cover is assumed to be maintained to prevent depletion of the cap.

Figure 6-1 depicts the cap design for Areas 1 and 2.

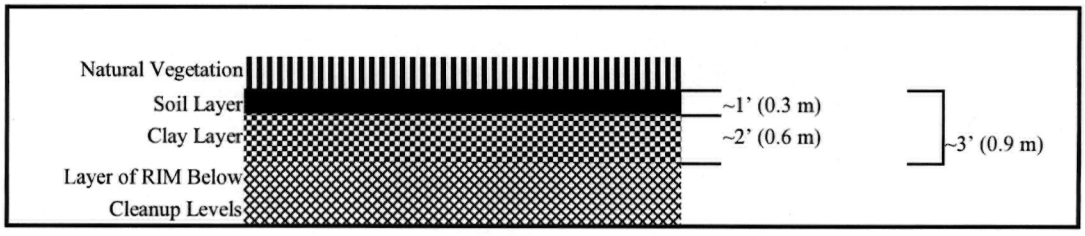

Figure 6-1 Stylized Cross-Section after RIM Has Been Excavated and Sent for Off-site Disposal "

EPA Appendix F - Risk Assessment # 19

Comment:

Section 6.2.3: The text here states that "This remedy would place a thick layer of trash and cover material over the residual RIM left in Areas 1 and 2." However, the description in Section 6.2.1 of the "physical configuration of the site after completion of the remedy" makes no mention of the use of "trash and cover material." The SFS should more clearly explain the use of "trash" as a cover material for RIM and why this cover material will be protective.

Discussion:

The backfilled landfill material is not a protective cover in the strictest sense, although it would provide additional distance and radiation shielding between RIM below cleanup levels left at the bottom of the excavation and potential receptors traversing the surface of OU1. Once the RIM above cleanup levels is removed, the intent is to regrade the excavated areas by backfilling much of the resulting excavations with previously excavated overburden or materials cut from surrounding areas. This will cover any residual RIM remaining at the bottom of the excavation with compacted landfill material. The thickness of this layer of backfilled materials would vary depending on the location and the final grading plan. The backfilled landfill materials will be covered by a low permeability, engineered cap, as described in Section 6.2.1.

The description in the text has been changed in response to this comment.

Proposed Text Change:

Section 6.2.3 has been revised to read:

"6.2.3 Identification of Exposure Pathways

Under this proposed remedy, only a few complete exposure pathways are viable. This remedy would place layers of cover material over the RIM below cleanup levels left in Areas 1 and 2. This would eliminate any exposure pathway requiring close proximity to the waste such as incidental ingestion and inhalation of particulates."